FGM

ambar

UNIVERSAL APS

TECHNICAL PROFILE



FGM

ESTHETICS

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1. INTRODUCTION

Ambar Universal APS is a light-curingr adhesive system designed for use on a wide variety of substrates, such as enamel, dentin, metals, ceramics, and composites. It is a self-etching adhesive that combines primer and adhesive in a single bottle, with a moderately acidic pH, eliminating, in most cases, the prior etching with phosphoric acid on both enamel and dentin. However, the selective acid-etching technique can be used on enamel to maximize adhesion, as well as total etching of enamel and dentin before adhesive application, when necessary.

One of the characteristics that gives **Ambar Universal APS** great versatility is the presence of the enhanced MDP monomer. This monomer enables effective bonding to substrates such as feldspathic ceramics, lithium disilicate, leucite, zirconia, metals, and fiberglass posts, among others. To ensure optimal bonding to these materials, additional procedures may be required, such as sandblasting, hydrofluoric acid etching, and silane application. This makes Ambar Universal APS an excellent option for the cementation of prosthetic pieces in combination with composite cements, whether self-curing, light-curing, or dual-cure.

The photoinitiation system of **Ambar Universal APS** uses APS (Advanced Polymerization System) technology, which complements and, partially, replaces the traditional camphorquinone-amine system. The APS system includes a small amount of camphorquinone, which acts as a “trigger” to initiate a complex chain reaction that generates free radicals throughout the curing process. The innovation lies in the use of alternative initiators and co-initiators, which interact with camphorquinone and the tertiary amine, promoting electron and proton exchanges and increasing the number of free radicals, resulting in a more efficient curing. This mechanism not only increases the degree of conversion of the material, but also prevents interference with the final shade of the adhesive, making it virtually colorless.

Additionally, the photoinitiator system of **Ambar Universal APS** has been formulated to be activated by any light-curing device available on the market, eliminating the need for specific equipment. This offers the professional all the advantages of the APS system without compromising compatibility with existing office resources. As a result, the product provides high curing efficiency and superior esthetics – without influencing the shade of the restorations – and, at the same time, expands bonding options on different substrates.



2. PRODUCT DESCRIPTION

Ambar Universal APS is a light-curing, self-etching adhesive in a single bottle, responsible for bonding dental structure (enamel and dentin) to restorative materials. The prior use of an etching agent is optional for both enamel and dentin. Therefore, the adhesive can be used in three modes: self-etching, selective etching on enamel, or total etching (enamel and dentin). **Ambar Universal APS** contains MDP, which allows its use as a primer for metals or ceramics.

APS is the acronym for Advanced Polymerization System and consists of a combination of different photoinitiators that interact with each other amplifying the curing ability of the light emitted by the light-curing device. When added to various materials, the system provides different advantages. When incorporated into **Ambar Universal APS**, the APS increases the degree of conversion in the hybrid layer, which enhances bond strength and improves the mechanical properties of the adhesive film (greater cohesive strength). The product has also gained the characteristic of becoming colorless, providing an interesting visual advantage when compared to other adhesive systems. This prevents any interference when performing restorations or cementation procedures in anterior teeth.

3. BASIC COMPOSITION

Methacrylate monomers (70-80%), phosphated methacrylate monomer (9-15%), water (3-9%), ethanol (< 5%), APS photoinitiator composition (< 5%), silica dioxide (< 5%) and stabilizers (< 2%).

4. MAIN CHARACTERISTICS

High adhesion in different application modes: total acid etching, selective etching on enamel and no acid etching.

Recommended for intraradicular application: provides high bonding strength, better curing (even in the apical region), and greater compatibility with dual-cure cements.

BPA Free: ensures safety and health.

Adhesion to different types of surfaces: metals, ceramics, composites, and fiberglass posts.

Enhanced MDP: in **Ambar Universal APS,** o MDP the MDP is more reactive, achieved through the redistribution of concentrations between solvent, water, and acidic monomers. This increased reactivity enhances adhesive strength to dentin (especially without prior acid etching) and indirect substrates, as well as improving the stability of the adhesive layer.



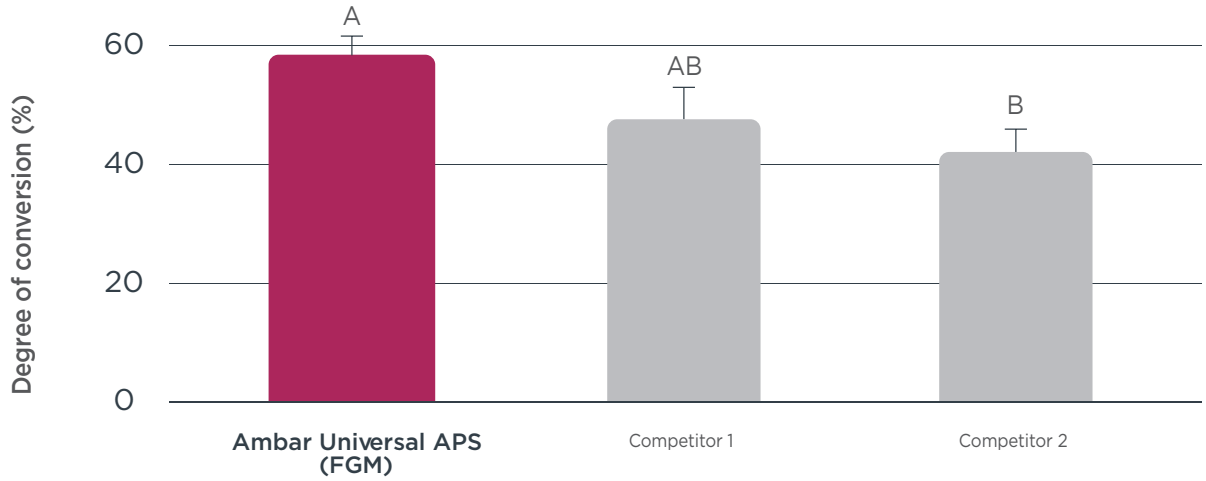
Colorless appearance: does not interfere with the esthetics of restoration and cementation procedures.

5. PHYSICOCHEMICAL PROPERTIES

5.1 DEGREE OF CONVERSION

To evaluate the degree of conversion of **Ambar Universal APS** (FGM) compared to two other competing universal adhesives, a drop of each adhesive was dispensed, subjected to an air jet, covered with an acetate strip and light-cured for 10 seconds. The samples were analyzed using Fourier Transform Infrared Spectroscopy (FTIR). The percentage of unpolymerized carbon-carbon double bonds (% C=C) was determined by the ratio between the absorbance intensities of the aliphatic C=C bonds relative to an internal standard, both before and after curing. The degree of conversion was calculated by subtracting the % C=C from 100%. The results are shown in figure 1, where it can be observed that Ambar Universal APS (FGM) exhibits an excellent degree of conversion immediately. The most relevant finding is that the adhesive demonstrated a statistically significant higher difference compared to the competitors ($p < 0.05$).

Figure 1. Mean ± standard deviation of the degree of conversion (%) of different universal adhesives. Different uppercase letters indicate a statistically significant difference ($p < 0.05$)



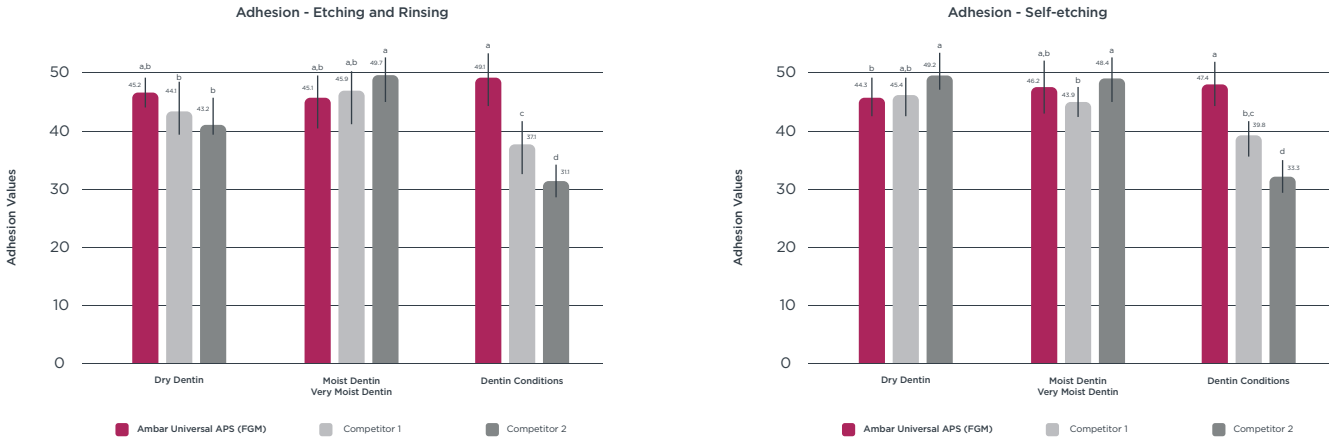
** Diferentes letras indicam diferenças estatísticas significantes entre os grupos (p < 0,05).*
Fonte: Klein-Junior CA et al. (2020).

5.2 BOND STRENGTH OF COMPOSITE TO DENTIN (MICRO-TENSILE BOND STRENGTH)

In this experiment, human molars were abraded until dentin exposure and restored using the **Ambar Universal APS** adhesive (FGM) and two other competing universal adhesives, applied according to different bonding strategies: with acid etching using Condac 37 phosphoric acid (FGM) or following the self-etching protocol (no acid etching). Dentin was considered as a variable, being evaluated under three moisture conditions: dry, moist, and very moist. The composite Opallis (FGM) was used as the final restorative material. After 24 hours, the teeth were sectioned to obtain stick-shaped specimens, which were subjected to the tensile bond strength test. The results are shown in table 1.

After 24 hours, no significant difference in bond strength was observed for most adhesives in dry or moist dentin, except for Competitor 2. However, in very moist dentin, **Ambar Universal APS** demonstrated superior bond strength compared to the competitors in both bonding strategies.

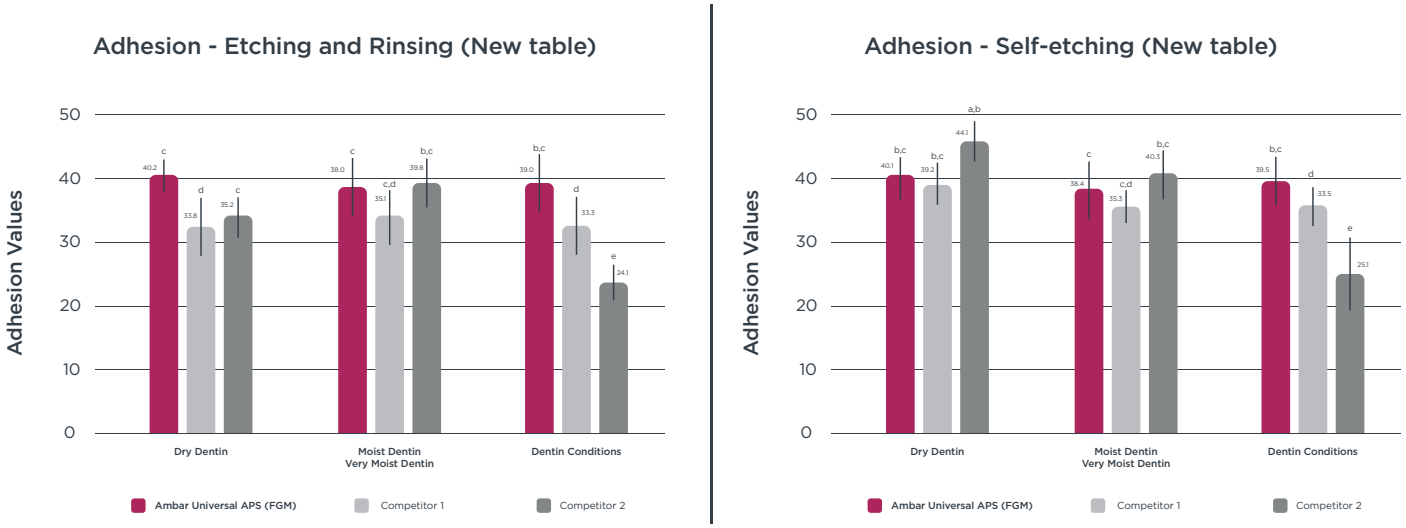
Table 1. Mean ± standard deviation of bond strength (μTBS) of different universal adhesives under different bonding strategies and dentin moisture conditions. Different lowercase letters indicate a statistically significant difference ($p < 0.05$)



**Diferentes letras indicam diferenças estatísticas significantes entre os grupos ($p < 0,05$).*
Fonte: Nonato RF et al. (2022).

As indicated in table 2, after 1 year of water storage, a significant decrease in bond strength was observed in all groups, with variations between the different adhesives. In moist dentin, no significant differences were found between the tested adhesives. However, in dry or very moist dentin, statistically significant differences were identified. In dry dentin, both **Ambar Universal APS** and Competitor 2 exhibited superior bond strength compared to Competitor 1 in the etching and rinsing protocol. In very moist dentin, **Ambar Universal APS** showed significantly higher bond strength in both bonding strategies, when compared to the competitors.

Figura 3.: Mean ± standard deviation of bond strength (μTBS) of different universal adhesives under different bonding strategies and dentin moisture conditions. Different lowercase letters indicate a statistically significant difference ($p < 0.05$).



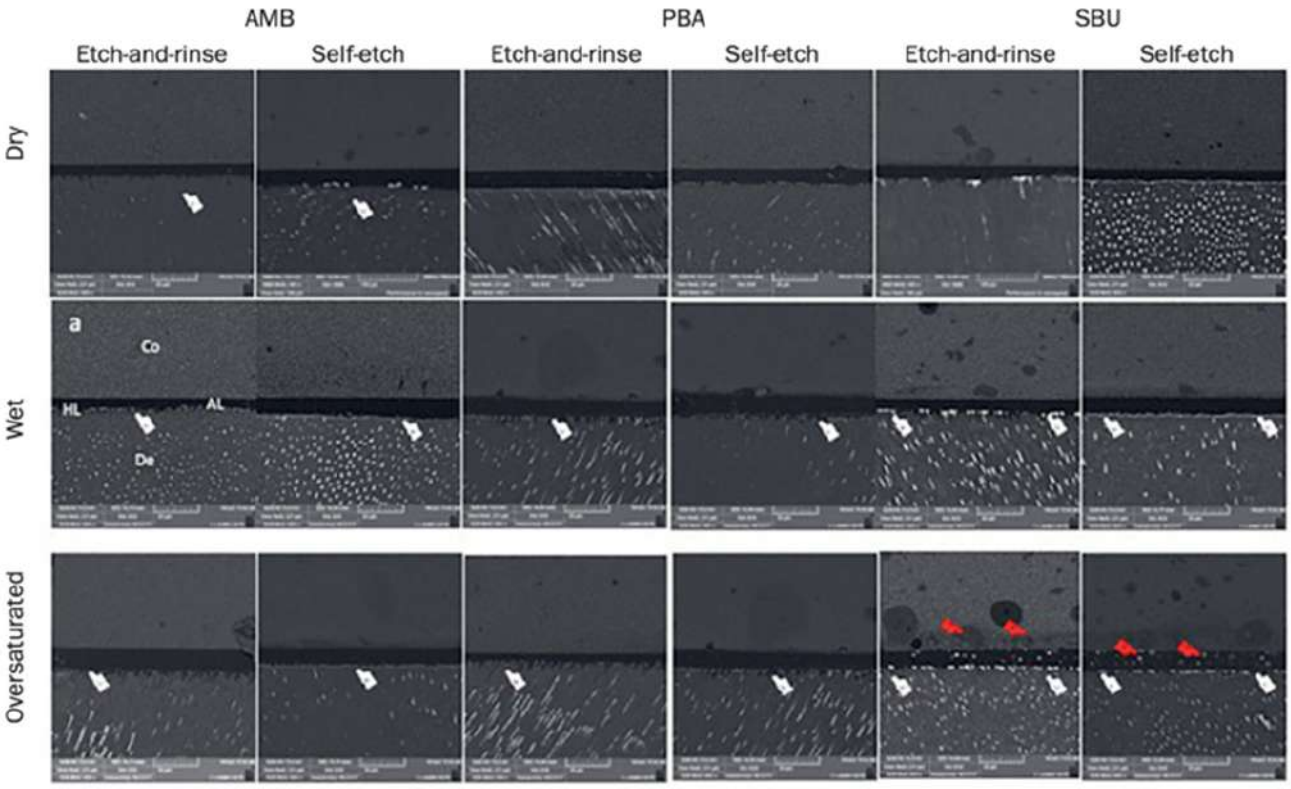
**Diferentes letras indicam diferenças estatísticas significantes entre os grupos ($p < 0,05$).*
Fonte: Nonato RF et al. (2022).

5.3 *NANOINFILTRATION BETWEEN COMPOSITE AND DENTIN (NANOLEAKAGE)*

Some of the stick-shaped specimens, cut in the previous test, were immersed in ammoniacal silver nitrate and, after the development process, analyzed by Scanning Electron Microscopy (SEM). This test allows observation of the amount of silver nitrate (visible as white areas in the photomicrographs), which indicates the presence of voids not filled by the adhesive or solvent/water retained in the adhesive network. The quality of the hybrid layer formed between the adhesive and the substrate is critical for the longevity of the restoration. The most representative images of this study are available in figure 4.

In figure 4, it can also be observed that, for all adhesives, after one year of water storage, the silver nitrate infiltration was very small, virtually restricted to the hybrid layer (marked in white) in the dry and moist dentin samples. However, when the dentin was very moist, it was found that Competitor 2 showed infiltration not only in the hybrid layer but also in the adhesive layer (marked in red).

Figura 4. Representative images of the specimens in MEV.



Co: composite; AL: adhesive layer; HL: hybrid layer; De: dentin.

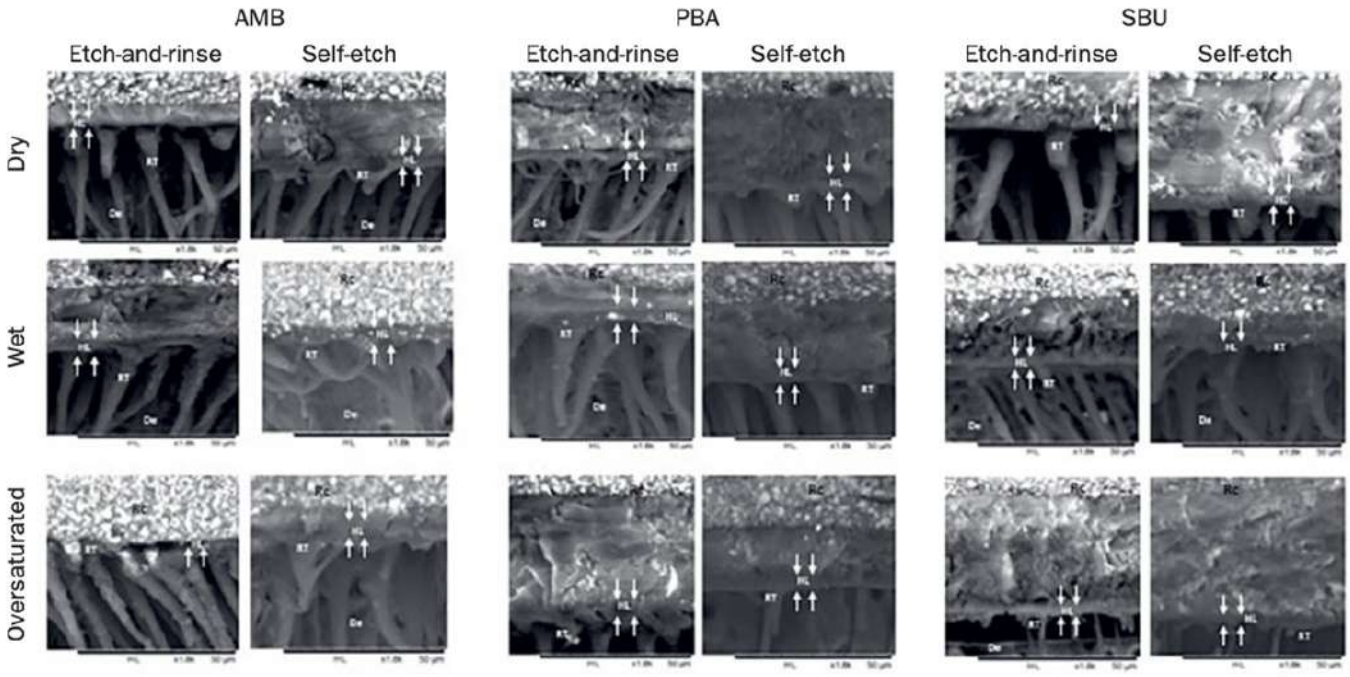
Fonte: Nonato RF et al. (2022).

5.4 EVALUATION OF THE ULTRAMORPHOLOGY OF COMPOSITE-DENTIN INTERFACES FORMED BY UNIVERSAL ADHESIVES

In this experiment, dentin surfaces were exposed, abraded, and restored using the **Ambar Universal APS** adhesive (FGM) and two other competing universal adhesives, applied according to different bonding strategies: with acid etching using Condac 37 phosphoric acid (FGM) or following the self-etching protocol (no acid etching). The dentin was evaluated under three moisture conditions: dry, moist, and very moist. The composite Opallis (FGM) was used as the final restorative material. The interfaces were sectioned and subjected to demineralization with hydrochloric acid solution, followed by deproteinization with sodium hypochlorite solution. This process aims to dissolve collagen fibers that were not fully covered by the adhesive. Below are the Scanning Electron Microscopy (SEM) images of the hybrid layers formed under the different conditions described. The results are shown in figure 5.

The representative images of the morphology of the hybrid layer produced by all groups at the immediate time point are shown in figure 3. On dry and moist dentin surfaces, all adhesives formed a hybrid layer with greater integrity, as well as a greater number of composite tags, which were longer and more numerous. On very moist dentin, both **Ambar Universal APS** and Competitor 1 demonstrated a higher number of composite tags compared to Competitor 2, which exhibited only a few thin, needle-like tags, especially when applied in the self-etching mode.

Figura 5: Representative images of the hybrid layer of all specimens in MEV.



Co: composite; AL: adhesive layer; HL: hybrid layer; RT: composite tag; De: dentin.

Fonte: Nonato RF et al. (2022).

5.5 **CYTOTOXICITY**

To evaluate the cytotoxicity of **Ambar Universal APS** (FGM) in mouse fibroblasts (NIH/3T3) compared to two other competing universal adhesives, a drop was dispensed onto a sterilized glass slide. The specimens were prepared immediately (with air from the dental chair [23 °C] at 10 cm from the slide for 10 seconds before light-curing). All specimens were subsequently light-cured for 10 seconds. Immediately after the light-curing process, the specimens from all three groups were immersed in cell culture medium. After 24 hours and 7 days of incubation, the extracts from the specimens were evaluated for cell viability using the MTT assay. Cellular inviability, as determined by the MTT test, does not necessarily indicate a higher occurrence of apoptosis and tissue necrosis; it may also reflect a higher number of cells with reduced metabolic activity. The percentage of viable cells was calculated and compared to the results obtained with the negative control (cells cultured in culture medium). The mean cytotoxicity (expressed by cell viability) as a percentage relative to the negative control for the adhesive systems was compared in terms of the cell viability rates in NIH/3T3 mouse fibroblast cultures.

All tested materials exhibited cytotoxicity in mouse fibroblasts. In general, in the 7-day analysis, the cell viability results were lower than those observed at 24 hours. In the 24-hour cell viability analysis, no differences were detected between the adhesives. In the 7-day analysis, **Ambar Universal APS** showed more viable cells compared to the others ($p < 0.05$).

Tabela 1: Mean ± standard deviation of cell viability (%) for different universal adhesives, obtained after 24 hours and 7 days.

Adhesives	24 hours	7 days
Ambar Universal APS	14,64 ± 1,08 A	6,34 ± 0,26 A
Competitor 1 (Scotchbond Universal Adhesive)	14,93 ± 1,18 A	5,92 ± 0,16 B
Competitor 2 (Tetric N-Bond Universal)	14,13 ± 0,33 A	5,78 ± 0,35 B

**Letras diferentes nas colunas indicam diferenças estatisticamente significantes entre os grupos p < 0,05.*
Fonte: Klein-Junior CA et al. (2020).

5.6 **BOND STRENGTH BETWEEN CEMENT AND INTRARADICULAR DENTIN (PUSH-OUT SHEAR TEST)**

In the intraradicular bond test, human premolars had their crowns removed, and the pulp cavity space underwent a standardized endodontic treatment. After one week, the root canal was cleared and prepared using White Post DC2 drills (FGM), preserving 4 mm of the apical obturated region. After superficial cleaning, the **Ambar Universal APS** adhesive (FGM) and two other universal adhesives were applied according to the manufacturer's recommendations, with or without phosphoric acid (total etching or self-etching protocol). When Condac 37 phosphoric acid (FGM) was used, it was applied for 15 seconds, followed by washing with water and drying with air for 5 seconds and two absorbent paper cones. The adhesives were applied with a microapplicator. Immediately after the adhesive application, Allcem cement (FGM) was inserted into the root canal using a special syringe for this purpose. The White Post DC2 fiberglass post (FGM) was then positioned in the canal, and light-curing was performed for 40 seconds at the cervical region. After 24 hours of storage, the roots were sectioned into disks, and part of them underwent the push-out resistance test. The results are shown in table 2.

Ambar Universal APS (FGM) presented high adhesion values to intraradicular dentin. However, there was no significant difference in adhesion between the samples etched with phosphoric acid and those subjected to the self-etching protocol. The other adhesive systems showed a marked decrease in adhesive properties in the apical third, when compared to **Ambar Universal APS (FGM).**

Tabela 2: Means and standard deviations of the push-out resistance test values obtained for all experimental conditions.

Ambar Universal APS			
	Cervical	Middle	Apical
Etching and rinsing	13,6 ± 4,5 AB	12,1 ± 5,7 AB	13,6 ± 4,7 AB
Self-etching	11,9 ± 6,2 AB	10,9 ± 3,6 BC	12,2 ± 3,4 AB
Competitor 1 (old Ambar)			
	Cervical	Middle	Apical
Etching and rinsing	15,9 ± 2,7 A	12,3 ± 6,1 AB	8,2 ± 3,3 BC
Self-etching	13,9 ± 5,5 A	10,6 ± 2,8 BC	9,2 ± 4,0 BC
Competitor 2			
	Cervical	Middle	Apical
Etching and rinsing	13,4 ± 4,7 AB	10,4 ± 4,6 BC	7,5 ± 2,7 C
Self-etching	13,6 ± 5,6 AB	10,6 ± 4,4 BC	7,3 ± 2,4 C

**Letras diferentes indicam diferenças estatisticamente significantes entre os grupos p < 0,05.*
Fonte: Carvalo RF et al. (2020).

After 24 months of storage

After 2 years of storage, the samples were subjected to push-out resistance test, and the results are presented in table 6. **Ambar Universal APS (FGM)** maintained high adhesion values to intraradicular dentin, with no significant differences between the samples etched with phosphoric acid and those treated with the self-etching protocol. In contrast, the other adhesive systems showed a marked decrease in bonding properties in the apical third, when compared to **Ambar Universal APS** (FGM).

Tabela 3. Means and standard deviations of the push-out resistance test values for all experimental conditions.

Ambar Universal APS			
	Cervical	Middle	Apical
Etching and rinsing	11,9 ± 2,7 AB	10,9 ± 2,4 BC	9,2 ± 2,3 AB
Self-etching	11,8 ± 2,3 AB	11,4 ± 2,8 AB	11,7 ± 2,6 AB
Competitor 1 (old Ambar)			
	Cervical	Middle	Apical
Etching and rinsing	10,4 ± 2,8 BC	8,6 ± 2,0 CD	7,2 ± 2,0 D
Self-etching	10,2 ± 1,8 BC	7,7 ± 2,1 D	6,2 ± 2,4 BC
Competitor 2			
	Cervical	Middle	Apical
Etching and rinsing	8,8 ± 2,2 C	6,2 ± 2,5 D	5,3 ± 2,4 D
Self-etching	8,5 ± 2,6 C	6,8 ± 2,1 D	4,6 ± 2,0 D

**Letras diferentes indicam diferenças estatisticamente significantes entre os grupos p < 0,05.*
Fonte: Moreira PHA et al. (2023).

5.7 *NANOINFILTRATION AND DEGREE OF CONVERSION BETWEEN CEMENT AND INTRARADICULAR DENTIN*

A portion of the slices cut in the previous test was placed in ammoniacal silver nitrate and, after development, observed under Scanning Electron Microscopy. In this test, the amount of silver nitrate (white in the photomicrographs) can be observed. Another portion of the slices was observed by micro-Raman spectroscopy to verify the degree of conversion of the hybrid layer formed in each third.
The lower the degree of conversion, the lower the mechanical properties of the adhesive interface and the greater the chances of degradation over time. The results can be seen in table 4.

Ambar Universal APS (FGM) showed low nanoleakage values and high degree of conversion within the hybrid layer, especially in the cervical and middle thirds. Both evaluated properties varied significantly among the root thirds, increasing nanoleakage and decreasing degree of conversion as it progresses from the cervical region toward the apex of the root.

Tabela 4: Means and standard deviations of the values obtained for nanoleakage and in situ degree of conversion under all experimental conditions

		Nanoleakage		Degree of conversion in the hybrid layer	
		Etching and rinsing	Self-etching	Etching and rinsing	Self-etching
Ambar Universal APS	Cervical	7,3 ± 1,3 A	7,2 ± 1,1 A	73,9 ± 2,5 a	78,6 ± 3,9 a
	Middle	8,0 ± 1,7 AB	6,6 ± 1,6 A	65,2 ± 5,0 a	65,4 ± 6,2 b
	Apical	7,9 ± 1,1 AB	6,1 ± 1,1 A	63,3 ± 5,5 b	63,2 ± 5,5 b
Competitor 1 (old Ambar)	Cervical	7,1 ± 1,7 A	6,9 ± 0,9 A	71,0 ± 6,5 a	73,3 ± 5,6 a
	Middle	9,9 ± 1,1 B	7,8 ± 2,2 AB	56,9 ± 6,5 C	56,4 ± 3,8 c
	Apical	11,3 ± 1,6 C	11,1 ± 2,7 C	45,6 ± 7,8 D	52,9 ± 3,8 CD
Competitor 2	Cervical	8,3 ± 1,1 AB	7,7 ± 1,2 A	75,4 ± 2,3 a	74,1 ± 2,7 a
	Middle	9,7 ± 1,0 BC	11,1 ± 1,2 C	51,6 ± 4,5 C	59,3 ± 6,5 bc
	Apical	11,5 ± 1,1 C	12,2 ± 1,6 C	41,9 ± 1,9 d	43,1 ± 5,1 d

Fonte: Carvalho RF et al. (2020).

5.8 **CLINICAL PERFORMANCE**

120 restorations were performed on non-carious cervical lesions with the purpose of evaluating the clinical performance of different composites. The Universal APS adhesive was used as the bonding agent in all restorations. The cervical lesions underwent prophylaxis, followed by local anesthesia and absolute isolation. The **Ambar Universal APS** adhesive system was applied in self-etching mode for dentin, with selective etching of the enamel using 37% phosphoric acid (Condac) for 30 seconds, followed by abundant rinsing.

The cavities were restored following two protocols: shade combination with Vittra APS or sole use of Vittra Unique APS. The composites were placed in increments of up to 2 mm, with curing at each step. The restorations were finished using fine and extra-fine diamond drills, followed by polishing.

The restorations were evaluated using the World Dental Federation (FDI) criteria up to 18 months after the procedure. Data were analyzed using the chi-square test, with a significance level set at $\alpha = 0.05$. During the 18-month period, no restoration was lost or fractured, representing 100% clinical performance.

The **Ambar Universal APS** adhesive demonstrated excellent bonding performance, surpassing universal adhesives available on the market. It is noteworthy that previous clinical studies with its predecessor, **Ambar Universal (FGM)**, reported retention rates between 89% and 93% after 18 months. The addition of a more hydrophilic photoinitiator to Ambar Universal APS appears to have improved the curing process, as indicated by recent studies showing an increase in the immediate degree of conversion. This resulted in higher bond strength, explaining the high retention rates observed after 18 months of clinical follow-up.

Fonte: Miranda et al. 2024





Female patient, 35 years old

CHIEF COMPLAINT:

The patient sought treatment due to aesthetic dissatisfaction with her smile, specifically regarding the shape, size, positioning, and coloration of the teeth.

UPPER AND LOWER ESTHETIC REHABILITATION WITH CERAMIC VENEERS

Authors: **Dr. Felipe Pinto Paredes Rodrigues e CDT Arnã Ariel da Costa**

STEP-BY-STEP



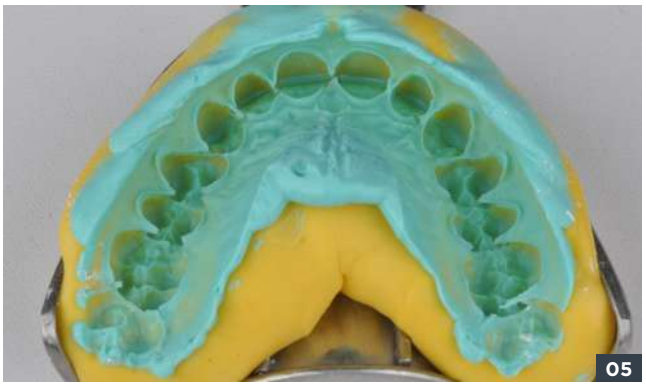


Fig. 1 Initial appearance of the patient.
Fig. 2 Esthetic planning with PrimmaArt Bleach FGM – mock-up.



Fig. 3 Orientation guides – preparation over the mock-up.







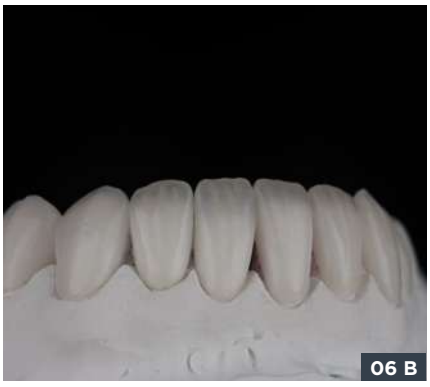




Fig. 4 Appearance of the teeth after preparation over the mock-up. | **Fig. 5** Upper impression using addition silicone.
Figs. 6a, 6b and 6c Ceramic veneers.







Fig. 7 Etching with Condac Porcelana (FGM) | **Fig. 8** Application of Condac 37 (FGM) on the veneers
Fig. 9 Silanization of the veneers with Prosil (FGM).



Fig. 10 After etching the teeth with Condac 37 (FGM), Ambar Universal APS adhesive (FGM) was applied.











Figs. 11a and 11b Cementation with Allcem Veneer APS Trans FGM.
Fig. 12 Intraoral photograph of the upper ceramic veneers immediately after cementation.
Fig. 13 Lateral view of the smile.
Fig. 14 Final appearance of the smile.

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