



ORIGINAL RESEARCH ARTICLE

OPEN ACCESS

IN VITRO COMPARISON OF MICROLEAKAGE IN CLASS V CAVITIES USING SELF ETCH ADHESIVES AND RESTORATIVE RESINS-A SYSTEMATIC REVIEW

Dr. Ekta A. Sengar, Dr. Sanjyot Mulay and Dr. Lotika Beri

Department of Conservative Dentistry and Endodontics, Dr. D.Y. Patil Dental College and Hospital,
Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune

ARTICLE INFO

Article History:

Received 15th October, 2017
Received in revised form
26th November, 2017
Accepted 07th December, 2017
Published online 31st January, 2018

Key Words:

Class V Cavities,
Self - Etch Adhesives,
Microleakage, Restorative Resin.

ABSTRACT

Background: Adhesion of restorative material to tooth structure in class v cavities is challenging due to margins lying on enamel and cementum. Sealing ability of newer generations of self etch adhesives have claimed to be better than the previously introduced dentin bonding adhesives. The aim of this review is to evaluate bonding efficacy of self etch adhesives in class V cavities.

Study Eligibility Criteria: The inclusion criteria were articles in English or those having detailed summary in English, published between 2009 to 2017. Articles providing information about self etch adhesives i.e 6th, 7th and 8th generation bonding agents. Articles providing information about in vitro comparative studies in which class V cavities are prepared. However, only articles where class V cavities were restored using self etch adhesives were included. Review, case reports, abstracts, letters to editors, editorials were excluded. In vivo studies were excluded from this systematic review.

Conclusion: Two- step 6th generation bonding agent shows less micro leakage as compared to one step 6th generation bonding agent. No significant difference was seen between 6th and 7th generation bonding agents.

Copyright © 2018, Ekta A. Sengar et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Dr. Ekta A. Sengar, Dr. Sanjyot Mulay and Dr. Lotika Beri. 2018. "In vitro comparison of microleakage in class v cavities using self etch adhesives and restorative resins-A systematic review", *International Journal of Development Research*, 8, (01), 18655-18658.

INTRODUCTION

Today, composite resins are considered materials of choice in restorative dentistry because of the increasing demand of high quality aesthetic results in everyday practice (Scotti et al., 2014). Despite continuous evolution of resin based restorative material, polymerization shrinkage of resin still occurs¹. The essential factor in determining preservation of restoration is the marginal seal (Toledano et al., 2001). Though 5th generation etch and bond systems are considered gold standard. Compared with etch-and-rinse adhesives, several advantages have been ascribed to self-etching adhesives. The concept of self-etching approach was created approximately 20 years ago (Marcelo Giannini et al., 2015), Evolution began by Castan in 1938 and has reached a hallmark of self-etching systems (Rani Somani et al., 2016). The 6th generation self etch adhesive, consist of acidic primer giving an advantage of

eliminating the acid etching step. Apart from simplification of three-step to two-step application, the rationale behind this system was to superficially demineralize dentin and simultaneously penetrate it with monomers, which could be polymerized (Leinfelder, 2004). Seventh-generation self etch adhesives, introduced in the early 2000s, contain acidic primers and adhesive monomers in a single bottle, eliminating separate etching and mixing steps (John et al., 2009). Development in nanotech dentistry has led to development of nanocomposites and nano-adhesives which contain nano sized fillers. Nano-bonding agents are solutions with nanofillers which produce better bond strength to enamel and dentin, stress absorption, and longer shelf life and are termed as 8th generation bonding agents (Suresh et al., 2015). Restoring cervical lesions with resin composites has always been a problem, especially where a very thin layer of enamel is present in the gingival margin for bonding (Kumari, 2011). The higher organic content, tubular structure, fluid pressure and the low surface energy of dentin make bonding more critical. The newer generation of self-etching adhesive systems claim to offer better marginal adaptation and bond strength.

Corresponding author: Dr. Ekta A. Sengar,

Department of Conservative Dentistry and Endodontics, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pimpri, Pune.

Thus considering the available literature, the aim of this systematic review is to examine the marginal adaptation of composite resins using self etch adhesives in class V restorations.

Focused Question

Which self etch adhesive (6th, 7th and 8th generation bonding agent) reduces microleakage in class V cavities restored with resin material?

Objective

To evaluate bonding efficacy of 6th 7th and 8th generation bonding agents in Class V restoration with composite resin.

METHODS

Inclusion Criteria

- Articles in English or those having detailed summary in English.
- Studies published between 2009 to 2017.
- Articles providing information about 6th, 7th and 8th generation bonding agents.
- Articles providing information about in vitro studies in which class V cavities are prepared.

Exclusion Criteria

- Articles giving information about in vivo studies.
- Articles in which Class I, II and MOD cavities are filled with restorative resin.
- Case reports, abstracts, letters to editors and editorials.

The PICOS guidelines that were selected are

P- (PRODUCT) - Extracted teeth

I-(INTERVENTION)-Class V cavities filled with restorative resin using 6th generation bonding agent

C - (COMPARISON)-7th and 8th generation bonding agent to 6th generation bonding agent.

O - (OUTCOME) - Microleakage

Information Sources

Four internet sources of evidence were used in the search of appropriate papers satisfying the study purpose: The National Library of Medicine (MEDLINE PubMed), EBSCO HOST, SCOPUS and Google Scholar. The data bases were searched including January 2009 to September 2017 using the search strategy.

Search

The following databases were searched on PubMed (The limits used were all full text articles in English dated from 1st January 2009 to September 31st 2017), EBSCO HOST, SCOPUS and Google Scholar.

Study Selection Process

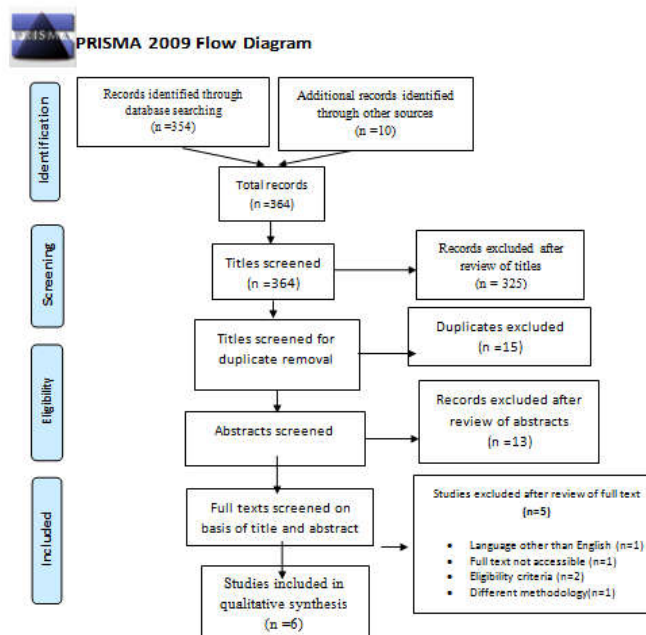
In vitro and Comparative studies were selected. However, only articles where V cavities were restored using self etch

adhesives and restorative resin which were assessed for microleakage using dye penetration method, visualised under microscope were included. Using different search strategies from the above mentioned key words and the combinations various electronic databases were searched. Total 354 articles were identified through the database searching and 10 articles were identified through other sources. After thorough screening of 364 titles, 325 articles were excluded. Further these records were assessed for any duplicates and search articles were removed. Further 24 articles were screened for abstracts. Thirteen articles were then excluded after review of abstracts. Eleven articles were then screened for full texts. These 6 articles were quantified and were then included in the study.

Table 1 Table showing keywords used in this systematic review

Primary key words	Secondary key words
Class v cavities	
Self etch adhesives	1. Self etch dentin bonding agents, 2. Newer generation bonding agents, 3. Newer generation dentin adhesives, 4. 6 th generation bonding agents, 5. 7 th generation bonding agents, 6. 8 th generation bonding agents
Microleakage	1. Sealing ability 2. Marginal adaptation
Restorative resin	Composite Resin

Keywords



RESULTS

Total 354 articles were identified through the database searching and 10 articles were identified through other sources. Total records obtained were 364. These articles were then screened for titles. After thorough reading of titles 325 articles were excluded as they did not match the motive of study. Further 39 articles were assessed for any duplicates and 15 articles were removed. Remaining 24 articles were then screened for abstracts and 13 articles were excluded after screening of abstracts as these articles did not include the eligibility criteria of study. Class V cavities was not the product and microleakage was not the outcome that was assessed.

Thorough reading of full texts of remaining 11 articles selected were assessed for eligibility. 5 articles were then excluded from the study, due to eligibility criteria not matching, language other than English, full text was not accessible. Lastly only 6 articles were included in the study.

DISCUSSION

The success of adhesive dentistry is closely associated to the marginal adaptation and bond strength of restoration. Newer generation single step dentin bonding adhesives has evolved with the aim of reducing chair side time and achieving less micro leakage. This systematic review has been undertaken to identify the best available self-etch adhesive with respect to micro leakage. Six studies met the inclusion criteria established for the present investigation.

Vinay et al in 2010 evaluated micro leakage between 5th, 6th, 7th generation bonding agent. They selected 50 extracted human upper premolar teeth and class V cavities were prepared on buccal and lingual surfaces.

Group 1- 5th generation bonding agent, Single Bond (3M, ESPE).
Group 2 -6th generation bonding agent, Adper Prompt (3M, ESPE).
Group 3- 7th generation bonding agent, IBOND(Kurary).
Group 4- 7th generation bonding agent, Clearfil S3 (Kurary).
Group 5 – 7th generation bonding agent, G-BOND (GC).

The cavities were restored with resin composite (Clearfil APX). Specimens were then subjected to thermocycling and immersed in methylene blue dye for 24hrs. In results, Group 4 i.e. 7th generation bonding agent, Clearfil S3 showed least microleakage (Sabine Geerts et al., 2012).

Sabine Geerts et al. in 2012 evaluated microleakage of two etch & rinse & two self etch adhesives. Twenty extracted human third molars were selected for this study, in which 40 class V cavities were made on buccal and lingual surfaces.

Group 1- Scotchbond multipurpose Universal adhesive.
Group 2- 5th generation bonding agent, Adper Scotchbond,
Group 3- 6th generation bonding agent, AdheSe,
Group 4- AdheSe One.

Teeth were then restored with microhybrid composite. Specimens were then subjected to thermocycling and immersed in 50% silver nitrate. Universal adhesive i.e. Scotch Bond Multipurpose showed the least microleakage (Maryam Khoroushi, 2012).

Maryam Khoroushi et al in 2012 evaluated marginal sealing ability of two self etch adhesives. Forty eight extracted human premolars were selected in this study. Class V cavities were prepared on buccal and lingual surfaces. Half of the cavity was filled with one step self etch adhesive BeautiBond (BB) and other half with two step self etch adhesive Clearfil Protect Bond (CPB). The cavities were then restored with APX composite resin. Specimens were further divided in subgroups in which one subgroup was evaluated after 24hrs after thermocycling, other subgroup was evaluated after 6 months storage in water and after thermocycling; and the last subgroup was evaluated after 6 months of storage in water. No significant difference was seen at enamel seal, However dentin seal of two step 6th generation bonding agent, Clearfil Protect

Bond (CPB) increased after 6 months storage in water and after thermocycling (Vivekananda Reddy et al., 2013).

Vivekananda Reddy et al., 2013, Vivekanand Reddy et al. in 2013 evaluated microleakage using 3 different self etch adhesives. Forty five extracted human central incisor were selected. Class V cavities were made on facial surface. Teeth were then divided in 3 groups.

Group 1- 6th generation one step bonding agent, Adper prompt (3MDentalproducts),
Group 2- AdheSE (Ivolar Vivadent)
Group 3- I-Bond (Heraeus Kulzer). Cavities were then restored with microfill composite (Ivoclar). Specimens were subjected to thermocycling and immersed in methylene blue dye for 24hrs. In results- at both enamel and dentin margins, two step self etch adhesive AdheSE performed better than one step self etch adhesives Adper prompt and I-Bond (Anjali Gupta et al., 2017).

Rani Somani et al in 2017 evaluated microleakage of newer generation bonding agents. Forty five extracted human premolars were selected for this study. Class V cavities were prepared. Samples were divided in three groups.

Group 1- FL Bond II,
Group 2- Xeno V,
Group 3- Futurabond DC.

The cavities were then restored with nanoceramic X composite resin. Further the samples were subjected to thermocycling, and then immersed in 2% methylene blue for 48hr. Least microleakage at both the occlusal and cementum margin was seen with 8th generation bonding agent, followed by 6th and 7th generation bonding agent (Leinfelder, 2004).

Anjali Gupta et al in 2017 evaluated microleakage using total etch, self etch and universal adhesive system. One hundred and twenty maxillary and mandibular premolars were selected for this study. Class V cavities were prepared. Samples were divided in 4 groups.

Group 1- 5th generation bonding agent-Adper Single Bond 2 (3M ESPE),
Group 2- 6th generation bonding agent- Adper SE Plus,
Group 3- 7th generation bonding agent- Adper Easy One,
Group 4- 8th generation bonding agent- Adper Single Bond.

Teeth were then restored with nanohybrid composite (Tetric N Ceram). Samples were then subjected to thermocycling and then immersed in 2% methylene blue for 24 hours and assessed for microleakage under a stereomicroscope. In the present study it was seen that that 7th generation bonding agent showed least microleakage at occlusal margin whereas 6th generation bonding agent showed least microleakage at gingival margin (Sooraparaju, 2014).

Limitations

- There is not enough documented literature regarding newer 8th generation self-etch adhesives.
- There is lack of literature comparing the 8th generation self-etch adhesives to the 6th and 7th generation adhesives.
- Lack in the standardization of evaluation procedures.
- The scoring criteria was different in the studies.

Conclusion

Within the limitations of this study, the following conclusions can be drawn

- Two- step 6th generation bonding agent shows less microleakage as compared to one step 6th generation bonding agent.
- Statistically no difference was seen between 6th and 7th generation bonding agents.
- Not enough literature is documented for comparison regarding the 8th generation bonding agent.
- It is difficult to draw conclusions from the articles selected as they cannot be compared directly due to the diversity of eligibility criterias, assessment methods and outcomes.

REFERENCES

- Anjali Gupta, Pradeep Tavane, Pankaj Kumar Gupta. 2017. evaluation of microleakage with total etch, self etch and universal adhesive systems in class v restorations: an in vitro study. *J Conserv Dent.* 11(4):53-56
- HL U, Kumari A, Mehta D, Kaiwar A, Jain N. 2011. Comparing microleakage and layering methods of silorane-based resin composite in class V cavities using confocal micrpscopy. *J Conserv Dent.*, 14(2):164-68
- John M. Powers, PhD; Kathy L. O'Keefe. 2009. Update on Seventh-Generation Bonding Agents. *Inside Dentistry.* 5(2)
- Leinfelder KF. 2004. Generation by generation: Not all bonding systems are created equally. *Oral Health J.*, 4:1-5
- Marcelo Giannini, Patricia Makishi, 2015. Ana Paula Almeida Ayres et al. Self-Etch Adhesive Systems: A Literature Review. *Brazilian Dental Journal.* 26(1):3-10
- Maryam Khoroushi1 and Mahsa Mansoori. 2012. Marginal Sealing Durability of Two Contemporary Self-EtchAdhesives. Article ID 204813
- Paul Joseph. 2013. Comparative evaluation of the bonding efficacy of sixth , seventh, and eighth generation bonding agent. *Int Rees J.*, 4(9)
- Rani Somani, Shipra Jaidka, Sameksha Arora. 2016. Comparative evaluation of microleakage of newer generation dentin bonding agents: An in vitro study. *IJDR.* 27(1):86-90
- Sabine Geerts, Amandine Bolette, Laurence Seidel et al. 2012. An In Vitro Evaluation of Leakage of Two Etch and Rinse and Two Self-Etch Adhesives after Thermocycling. *International Journal of Dentistry.* Article ID 852841
- Scotti N, Comba A, Gambino A, Paolino D, Alovise M, Pasqualini D et al. 2014. Microleakage at enamel and dentin margins with a bulk fill flowble resin. *Eur J Dent.*, 8(1):1-8
- Sooraparaju, S., Kanumuru, P., Nujella, S., Konda, K., Reddy K., Penigalapati, S. 2014. A comparative evaluation of microleakage in class V Composite Restoration. *International Journal of Dentistry.* Article ID 685643:1-4
- Suresh S Kamble, Baburajan Kandasamy, Ranjani Thillaigovindan et al. 2015. In vitro Comparative Evaluation of Tensile Bond Strength of 6th, 7th and 8th Generation Dentin Bonding Agents. *Journal of International Oral Health,* 7(5):41-43
- Toledano M, Osorio R, de Leonardi G, Rosales-Leal JI, Ceballos L, Cabrerizo-Vilchez MA. 2001. Influence of self-etching primer on the resin adhesion to enamel and dentin. *Am J Dent.*, 14:205-10
- Vinay, S., Vasundhara Shivanna. 2010. Comparative evaluation of microleakage of fifth, sixth, and seventh generation dentin bonding agents: An in vitro study. *J Conserv Dent.* Jul-Sep; 13(3): 136-140
- Vivekananda Reddy, Vamsi Krishna D, Madhusudhana K. 2013. A microleakage study of class v restorations using thee self-etching adhesives and microfill compostie resin-an in vitro stereo microscopic study. 5(4): 1-6
